CLAIMS

1. A non-blocking mechanical fiberoptic matrix switch, comprising:

N input optical fibers;

M output optical fibers;

a first plurality of stages each supporting an end portion of a corresponding one of the N optical fibers;

a second plurality of stages each supporting an end portion of a corresponding one of the M optical fibers; and

means for translating the stages along a plurality of overlapping paths to align a facet of a selected one of the N input optical fibers with a facet of a selected one of the M output optical fibers.

2. The switch of Claim 1 wherein the end portions of the fibers are each translatable along corresponding paths that define orthogonal X and Y axes.

3. The switch of Claim 2 and further comprising means for moving the end portions of at least some of the optical fibers along a plurality of Z axes perpendicular to the X and Y axes to mate and un-mate the facets of the selected input and output optical fibers.

4. The switch of Claim 1 where $N = M$.

5. The switch of Claim 1 wherein an end portion of each fiber is surrounded by a ferrule.

6. The switch of Claim 5 and further comprising means for moving at least some of the ferrules between a fully inserted position and a fully extracted position along a plurality of corresponding Z axes perpendicular to the overlapping paths in order to mate and un-mate the facets of the selected input and output optical fibers.

7. The switch of Claim 6 and further comprising spring means for biasing the ferrules to their fully inserted positions.

8. The switch of Claim 1 and further comprising a central panel having a plurality of holes, each hole being sized for having an end portion of a selected one of the N input optical fibers inserted into a first end of a selected hole in order to mate with a facet of a selected one of the M output optical fibers having an end portion inserted into a second end of the selected hole.

9. The switch of Claim 8 the end portions of the optical fibers are each surrounded by a ferrule and the holes in the central panel are tapered to facilitate alignment and insertion of the ferrules into the holes.

10. The switch of Claim 1 and further comprising a plurality of collimating lenses, each for transmitting a beam of light between aligned input and output fibers.

11. A method of switching beams of light directly between selected ones of N input optical fibers and M optical output fibers, comprising the steps of:

supporting an end portion of each of a plurality of N input optical fibers for independent translational movement along a first set of paths;

supporting an end portion of each of a plurality of M output optical fibers for independent translational movement along a second set of paths that overlap the first set of paths; and

translating a selected one of the N input optical fibers and a selected one of the M output optical fibers to align the fibers to permit a light beam to be transmitted from the selected input optical fiber to the selected output optical fiber.

12. The method of Claim 11 wherein the end portions of the input optical fiber move along corresponding X axes and the end portions of the output optical fibers move along corresponding Y axes orthogonal to the X axes.

13. The method of Claim 12 and further comprising the step of moving at least one of the selected fibers along a corresponding Z axis after alignment has been achieved in order to mate a facet of the selected input optical fiber with a facet of the selected output optical fiber.

14. The method of Claim 11 and further comprising the step of collimating each beam of light between aligned input and output fibers.

15. The method of Claim 12 and further comprising the step of moving each of the selected fibers along a corresponding Z axis after alignment has been achieved in order to mate a facet of the selected input optical fiber with a facet of the selected output optical fiber.

16. The method of Claim 11 wherein N = M.

17. The method of Claim 1 wherein all of the fibers are simultaneously translatable along their corresponding paths.

18. The method of Claim 11 and further comprising the steps of detecting a position of each of the fibers as its translates along its corresponding path and controlling the translation of each of the fibers in accordance with the detected position.

19. The method of Claim 12 wherein each of the fibers that is movable along a corresponding Z axis is first translated to a course alignment position, and during movement along the corresponding Z axis the fiber is further translated to a fine alignment position.

20. A non-blocking mechanical fiberoptic matrix switch, comprising:

N input optical fibers;

M output optical fibers;

a first plurality of stages each supporting a ferrule surrounding an end portion of a corresponding one of the N optical fibers;

a second plurality of stages each supporting a ferrule surrounding an end portion of a corresponding one of the M optical fibers;

means for translating the stages along a plurality of orthogonal X and Y axes to align a facet of a selected one of the N input optical fibers with a facet of a selected one of the M output optical fibers;

a central panel having a plurality of holes, each hole being sized for having the ferrule surrounding a selected one of the N input optical fibers inserted into a first end of a selected hole

in order to mate the facet of the selected one of the N input optical fibers with the facet of the selected one of the M output optical fibers having the ferrule surrounding its end portion inserted into a second end of the selected hole; and

means for moving the ferrules of at least some of the stages along a plurality of Z axes generally perpendicular to the X and Y axes to mate and un-mate the facets of the selected input and output optical fibers.

21. A non-blocking mechanical fiberoptic matrix switch, comprising:

a single input optical fiber;

M output optical fibers;

a stage supporting an end portion of the input optical fiber;

means for supporting an end portion of each of the M optical output fibers; and

means for translating the stage along at least one path to align a facet of the input optical fiber with a facet of a selected one of the M output optical fibers.

21. The switch of Claim 21 wherein the end portion of the input fiber is translatable along corresponding paths that define orthogonal X and Y axes.

23. The switch of Claim 22 and further comprising means for moving the end portion of the input optical fiber along a Z axis perpendicular to the X and Y axes to mate and un-mate the facets of the input optical fiber and the selected one of the M output optical fibers.

24. The switch of Claim 23 wherein an end portion of each fiber is surrounded by a ferrule.

25. The switch of Claim 24 and further comprising spring means for biasing the ferrule surrounding the input optical fiber to a fully inserted position.